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SHOCKPROOF RELAY CONTACT

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Fig. 1.

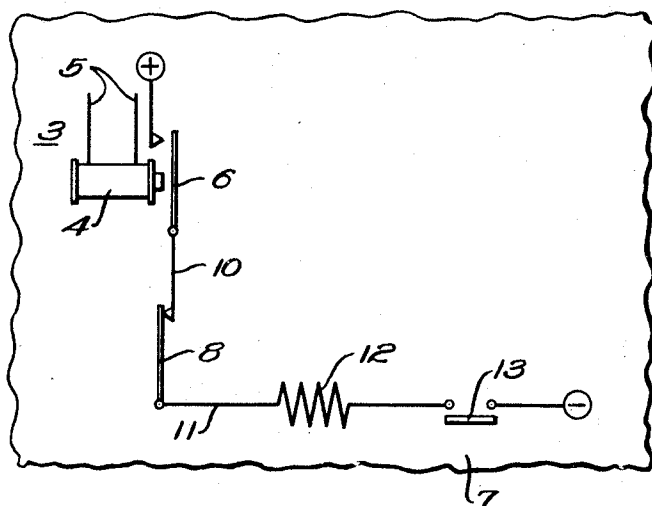
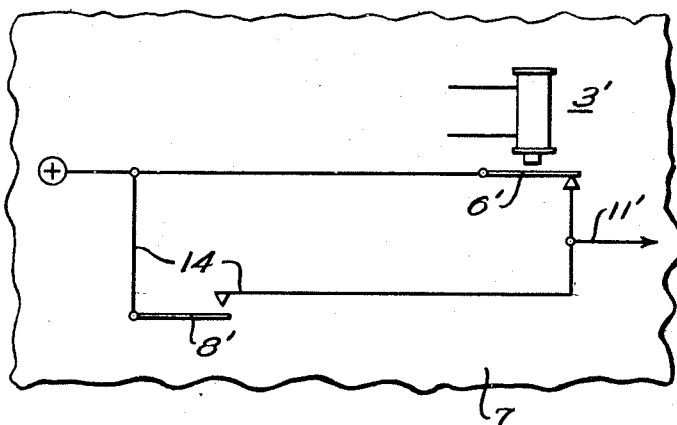


Fig. 2.



WITNESSES:

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SHOCKPROOF RELAY CONTACT

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10 Claims. (Cl. 175—320)

My invention relates to a control-contact combination which is substantially proof against unwanted actuations as a result of shocks or sudden accelerations in the supporting-means. It is operable on movable apparatus, such as a swinging panel or other movable object which is subject to jars or sudden accelerations, or on stationary objects which are subject to shock, such as bomb-explosions, and the like.

The principal object of my invention is to provide two biased contacts, both subject to the same shocks or accelerations, but one responding in a contact-closing direction, while the other responds in a contact-opening direction, one of the contacts being controlled by an electromagnetic coil or by any other desired controlling-means, and the other contact being electrically connected to the controlled contact in such manner that their respective responses to shocks or accelerations tend to cancel each other.

With the foregoing and other objects in view, my invention consists in the parts, combinations, apparatus, structures and methods hereinafter described and claimed, and illustrated in the accompanying drawing, wherein Figs. 1 and 2 are diagrammatic views of circuits and apparatus illustrating my invention in two different forms of embodiment, first, in a relay-circuit having normally open relay-contacts, and, second, in a relay-circuit having normally closed relay-contacts.

For purposes of illustration, I have illustrated my invention in connection with an electromagnetically operative relay, although, in general, I desire the relay-operating mechanism to be regarded as typical of any relay-operating mechanism, whether electromagnetic or not, so long as it is responsive to some force other than the acceleration-force which is to be guarded against, in connection with false or unwanted operations of the contacts.

In Fig. 1, I have shown a relay 3 comprising an electromagnet-structure 4, the winding of which is energized from any suitable control-circuit 5, and having a biased contact which is symbolically represented at 6. In Fig. 1, the biased contact 6 is normally open, and is adapted to be closed as a result of the control effected by the electromagnet-structure 4. The relay 3 is mounted on a panel 7, or other supporting-structure which is subject to shocks or sudden accelerations in such direction as to occasionally tend to erroneously close the relay-contact 6. In order to guard against this undesired action, in accordance with my invention, as shown in Fig. 1, I

provide a second set of biased relay-contacts 8, which are normally closed, and which are substantially unaffected by the relay-magnet 4.

The two contacts 6 and 8, in Fig. 1, are connected together, in an electrical circuit which is to be controlled, and which may be traced from the positive battery-terminal (+) to the normally open relay-contact 6, and thence, through a series-circuit connection 10, to the normally closed auxiliary contact 8, and thence to any desired circuit-connection 11, which may include a coil 12 of any controlled apparatus, such as the trip-coil of a circuit-breaker, and possibly one or more additional controlling-contacts 13, the circuit being completed at the negative battery-terminal (-).

In operation, the auxiliary contact 8 is mounted on the same supporting-structure 7 as the relay 3, and is so adjusted that a shock which tends to close the relay-contact 6 will open the auxiliary contact 8. The main and auxiliary contacts may be substantially identical, so as to have substantially identical time-constants and substantially identical responses to all types of shocks or accelerations which are to be encountered. In more exacting work, however, the auxiliary contact 8 will have such a time-constant and adjustment that a shock or acceleration which closes the main or relay-actuated contact 6 will open the auxiliary contact 8 before it closes the relay-contact 6, and the auxiliary contact 8 will thereupon keep open until after the relay-actuated contact 6 reopens, so that the controlled circuit 11 and the controlled apparatus 12 cannot be falsely energized as a result of any shock or acceleration which inadvertently closes the main control-contact 6 of the relay 3.

In Fig. 2, by way of further illustration, I have shown a relay 3' having a normally closed contact 6' which is shunted by a normally open auxiliary contact 8', the shunt-circuit being indicated at 14. In this case, the auxiliary, shock-excited, contact 8' is either identical with the main contact 6', or so adjusted that the same shock or acceleration which opens the main contact 6' will close the auxiliary contact 8', and will preferably close the auxiliary contact 8' before it opens the main contact 6', and will cause the auxiliary contact 8' to remain closed until after the main contact 6' resets, so that the relay-controlled circuit 11' will not be erroneously opened as a result of a shock or acceleration of the common supporting-means 7.

I claim as my invention:

1. A shockproof control-contact combination

comprising a support which is subject to sudden accelerations, an electrical circuit to be controlled, two contact-mechanisms mounted on said support in such manner as to be jointly affected by said accelerations, one in a contact-closing direction and the other in a contact-opening direction, additional means for actuating one of said contact-mechanisms, and electric-circuit means for associating the two contact-mechanisms in controlling relation to said circuit in such manner that their responses to accelerations tend to cancel each other, leaving the circuit substantially unchanged as a result of any acceleration.

2. A shockproof relay-combination, comprising an electromagnetic relay having a biased contact-means and a winding-means for controlling the operation of said contact-means, a second biased contact-means which is relatively unaffected by said winding-means, supporting-means for mounting both said relay and said second contact-means on a shock-susceptible support in such manner that the effect of any shock will tend to be exerted in a contact-closing direction on one of said contact-means and in a contact-opening direction on the other of said contact-means, and electrical connections for so connecting the two contact-means as to tend to cancel the effects of the shock-excitation of said two contact-means.

3. The invention as defined in claim 1, characterized by the contact-mechanism which is actuated by said additional means including a normally open contact which is closed as a result of the control exercised by said additional means, the other contact-mechanism including a normally closed contact, and the electric-circuit means including means for connecting said normally open contact and said normally closed contact in series with each other.

4. The invention as defined in claim 1, characterized by the contact-mechanism which is actuated by said additional means including a normally open contact which is closed as a result of the control exercised by said additional means, the other contact-mechanism including a normally closed contact so adjusted that an acceleration which opens it will, in general, open it before the same acceleration closes said normally open contact, and will cause it to remain open until after the normally open contact reopens, and the electric-circuit means including means for connecting said normally open contact and said normally closed contact in series with each other.

5. The invention as defined in claim 2, characterized by said relay-contact-means being nor-

mally open, and said second contact-means being normally closed, and the electrical connections connecting the two contact-means in series-circuit relation.

6. The invention as defined in claim 2, characterized by said relay-contact-means being normally open, and said second contact-means being normally closed and being so adjusted that a shock which opens it will, in general, open it before the same shock closes the relay-contact-means, and will cause it to remain open until after the relay-contact-means reopens, and the electrical connections connecting the two contact-means in series-circuit relation.

7. The invention as defined in claim 1, characterized by the contact-mechanism which is actuated by said additional means including a normally closed contact which is opened as a result of the control exercised by said additional means, the other contact-mechanism including a normally open contact, and the electric-circuit means including means for connecting said normally open contact and said normally closed contact in parallel-circuit relation.

8. The invention as defined in claim 1, characterized by the contact-mechanism which is actuated by said additional means including a normally closed contact which is opened as a result of the control exercised by said additional means, the other contact-mechanism including a normally open contact so adjusted that an acceleration which closes it will, in general, close it before the same acceleration opens said normally closed contact, and will cause it to remain closed until after the normally closed contact recloses, and the electric-circuit means including means for connecting said normally open contact and said normally closed contact in parallel-circuit relation.

9. The invention as defined in claim 2, characterized by said relay-contact-means being normally closed, and said second contact-means being normally open, and the electrical connections connecting the two contact-means in shunt to each other.

10. The invention as defined in claim 2, characterized by said relay-contact-means being normally closed, and said second contact-means being normally open and being so adjusted that a shock which closes it will, in general, close it before the same shock opens the relay-contact-means, and will cause it to remain closed until after the relay-contact-means recloses, and the electrical connections connecting the two contact-means in shunt to each other.

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